

REMARKS/ARGUMENTS

Claims 11-13 have been canceled. Claims 8-10 and 14-18 are active in the case.

Reconsideration is respectfully requested.

The present invention relates to a method of producing light hydrocarbons.

Claim Amendments

Claim 7 has been amended with respect to several parameters of the claimed process. The crystalline aluminosilicate zeolite catalyst is now defined as having a $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio ranging from 50 to 300. Support for this limitation can be found in two portions of the specification wherein basis for the minimum ratio is found in Example 1 on page 8, line 10, while support for the upper limit of 300 is found on page 5, lines 12-14.

The claim has also been amended to recite a steam/hydrocarbon mass ratio of ranging from 0.1 to 1, support for which can be found in previously active Claim 13. Finally, Claim 7 has been amended to recite a catalyst/hydrocarbon mass ratio ranging from 18 to 40, support for which can be found on page 7, 2nd paragraph of the text. Accordingly, since none of the amendments that have been made introduce new matter into the case, entry of the amendments into the record is respectfully requested.

Claim Rejection, 35 USC 103

Claims 7-17 stand rejected based on 35 USC 103(a) as obvious over JP 11-180902 in view of Friedrich et al U. S. Patent 3,669,877 and Miller et al, U. S. Patent 4,340,465. This ground of rejection is respectfully traversed.

The cited '902 reference is germane to the present invention, as stated previously, because it describes a method of catalytically cracking hydrocarbon feed materials over a catalyst of a rare earth element supported on a zeolite. The stated objective is to prepare light

olefins such as ethylene and propylene by a cracking reaction by a method which achieves high selectivity to the light olefin materials. A preferred catalyst support is either ZSM-5 or ZSM-11. The reference in paragraph [0009] discloses that the reactor employed may contain a fixed bed or fluidized bed catalyst material. The reference therefore clearly teaches an equivalency between the two types of catalyst systems. However, there are no teachings or description in the reference of operational details of any fluidized bed system, this despite the fact as discussed in the attached pages of a book of which certain sections have been translated, that there are disadvantages in fluidized bed systems as discussed on page 377. Even today, despite the fact that many fluidized bed systems have been constructed, the current state-of-the-art of the equipment of such systems is that the operation and maintenance of the systems has to be done empirically, and that criteria for the design and operation of such systems have not been firmly established. In the invention many difficulties have been encountered with the fluidized bed system in order to fix operational conditions. Accordingly, when a fluidized bed system is used for a new chemical reaction, the best way of operating such a system is accomplished by trial and error. When a different chemical reaction is investigated, the operational control conditions will be quite different.

The gaseous hydrocarbon feed may be diluted with nitrogen, hydrogen, He or steam. If steam is supplied as a diluent, the amount ranges from 0.1 to 1 wt %. However, there does not appear to be a clear description of the effect of a continuous regeneration of catalyst in the system by the use of the steam unlike the present claims which require a continuous regeneration of catalyst. In this connection it should be noted that the amount of steam that is used is expressed in terms of weight percent. On the other hand, in the present claims the amount of steam is given in terms of a mass ratio of steam to hydrocarbon of 0.1 to 1. Since the two ranges are quantified in different terms of wt % and mass ratio, it is evident that the

% range of the reference is not a mass ratio. Accordingly, the '902 reference does not suggest the invention as claimed.

Although the Friedrich et al patent pertains to catalyst bed containing reactors in which hydrocarbon feed is processed, the objective of the patent is an apparatus for conducting fluidized bed reactions. In particular the patent discloses multichamber reactors. The patent, in fact, discloses a method of manufacturing gasoline that contains significant quantities of aromatic hydrocarbons as anti-knock agents. The patent discloses a procedure by which light olefins can be made using reaction equipment. While it is possible to achieve catalyst bed regeneration using the fluidized bed apparatus described in the patent, a disclosure of such a continuous catalyst regeneration in a fluidized bed or moving bed or by transfer line reaction is not even hinted at in the patent.

Applicants also point out that the zeolite catalyst material of the patent is a high silica content material having a silica to alumina ratio of at least 500. On the other hand, the present crystalline zeolite catalyst component has a $\text{SiO}_2/\text{Al}_2\text{O}_3$ molar ratio ranging from 50 to 300 so that the zeolite disclosed in the patent is not that which is used in the present process. Further, the catalyst to hydrocarbon ratio in the process of the reference ranges from 2 to 15, while in the present process the catalyst to hydrocarbon ratio ranges from 18 to 40. These differences in reaction features between the reference and the corresponding limitations in the present claims clearly demonstrate that the reference does not bring the '902 reference closer to the present invention.

Applicants point out that another feature of the reference is that it allows the presence of aromatic hydrocarbons in the gasoline product that is produced in order to increase the octane value (anti-knock value) of the product. This is not the case in the present invention where the content of aromatics in the product is as small as possible.

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Yet another distinction is that the reference does not show or suggest the addition of steam into the input of the reactor, whereas such addition of steam is essential to the operation of the presently claimed process.

It must also be kept in mind that it is most difficult to combine the "902 reference with Friedrich et al since Friedrich et al is concerned with the production of gasoline, while '902 is concerned with the production of light oils. Moreover, the ingredients of the catalysts used in the two disclosures are quite different, as well as the running conditions that are taught. Thus, the two references can not be properly combined.

Finally, applicants maintain their previously expressed opinion of the Miller et al reference as of secondary interest to the issues in the case. Accordingly, withdrawal of the rejection is respectfully requested.

It is believed that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

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